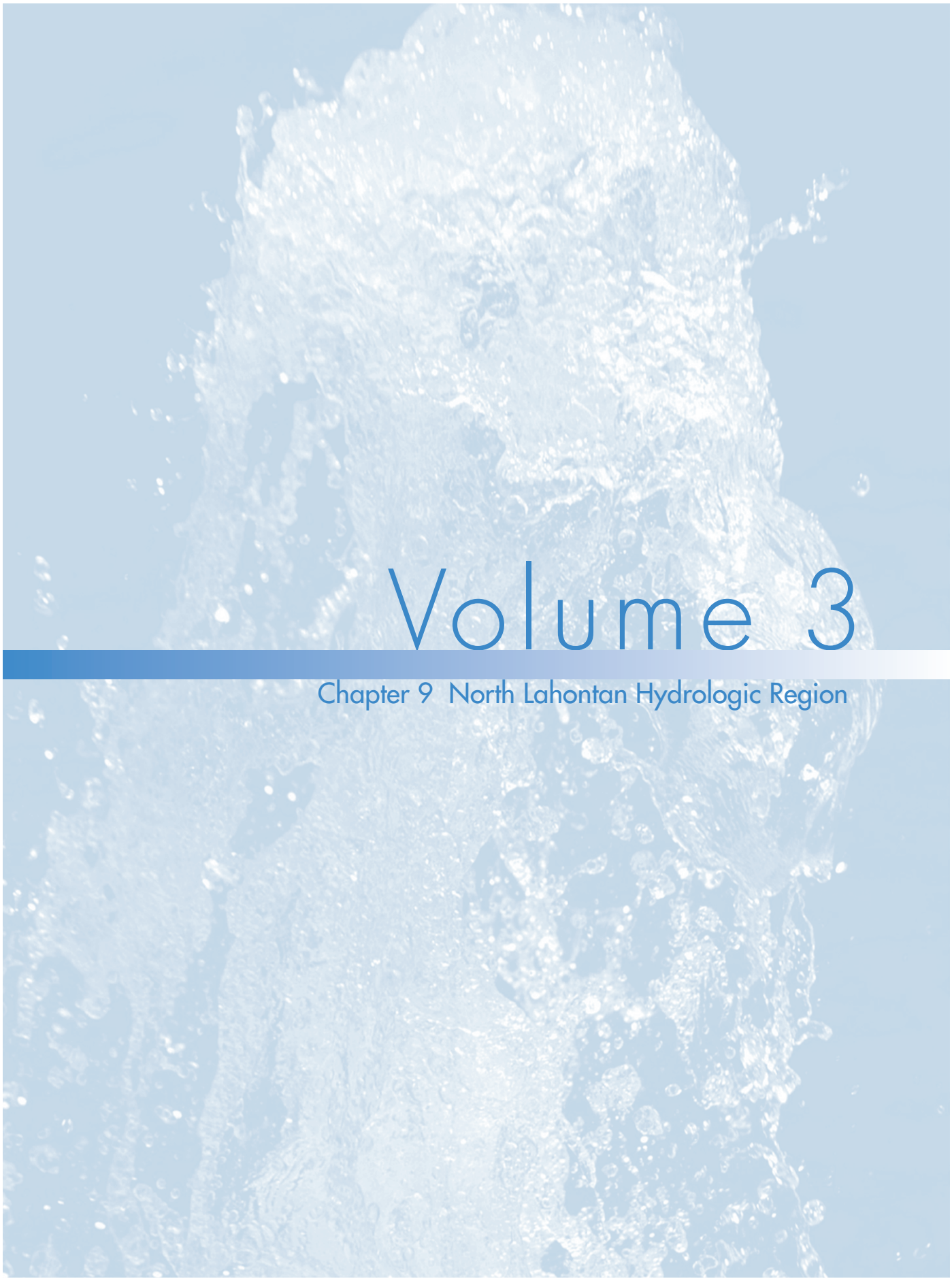


Volume 3

Chapter 9 North Lahontan Hydrologic Region

Chapter 9 North Lahontan Hydrologic Region

Contents

Chapter 9 North Lahontan Hydrologic Region 9-1
Setting 9-1
Climate 9-1
Population 9-1
Land Use 9-1
Water Supply and Use 9-2
State of the Region 9-5
Challenges 9-5
Accomplishments 9-6
Relationship with Other Regions 9-7
Looking to the Future 9-8
Water Portfolios for Water Years 1998, 2000, and 2001 9-8
Selected References 9-8

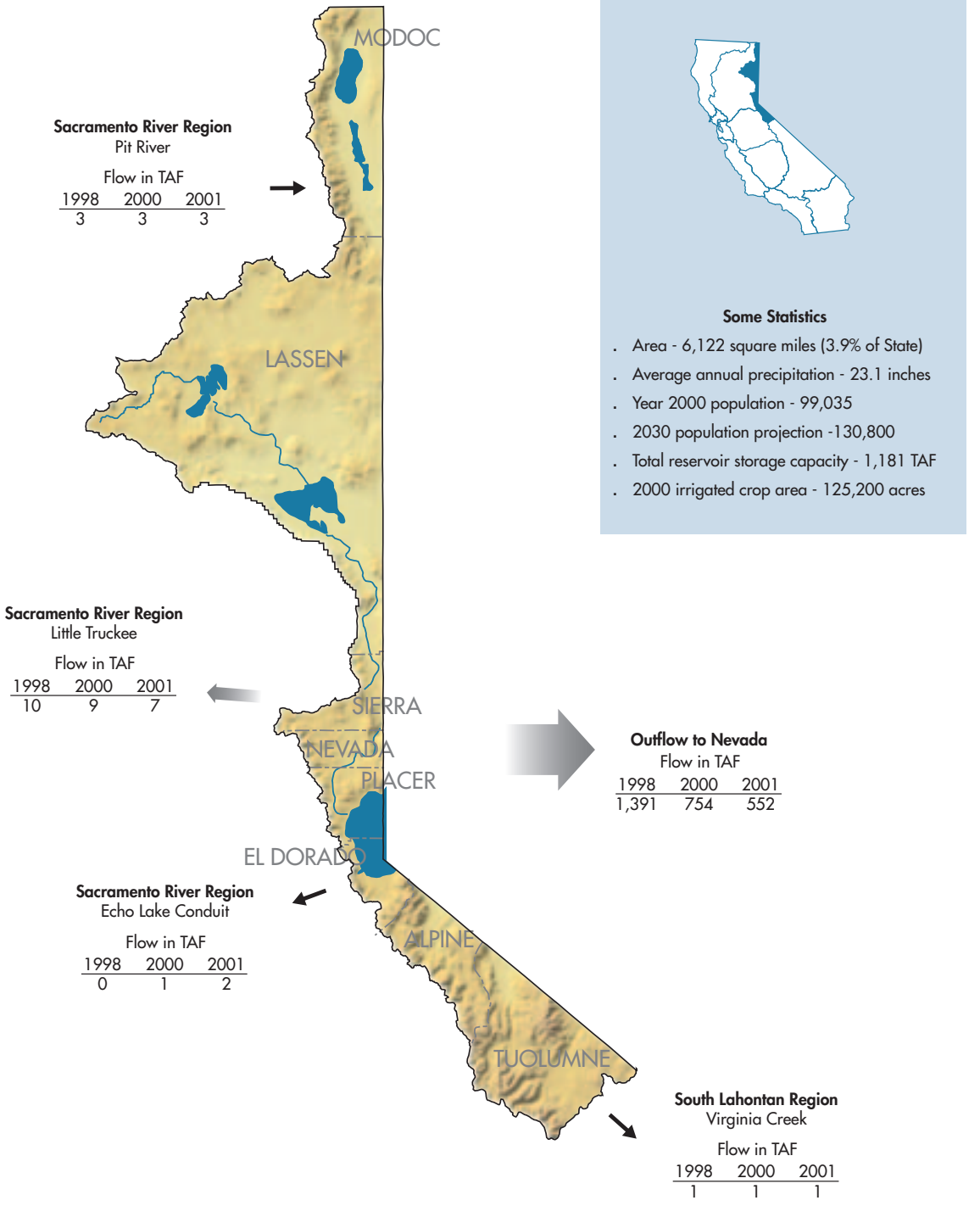
Figures

Figure 9-1 North Lahontan Hydrologic Region (map) 9-ii
Figure 9-2 North Lahontan Hydrologic Region population 9-3
Figure 9-3 North Lahontan region water balance for water years 1998, 2000, 2001 (2 bar charts) 9-4
Figure 9-4 North Lahontan region - illustrated water flow diagram 9-13
Figure 9-5 North Lahontan region - schematic flow diagram 9-14

Tables

Table 9-1 North Lahontan Hydrologic Region water balance summary 9-9
Table 9-2 North Lahontan Hydrologic Region water use and distribution of dedicated supplies 9-10
Table 9-3 North Lahontan region water portfolios 9-12

Figure 9-1 North Lahontan Hydrologic Region



The North Lahontan Hydrologic Region is in the northeast corner of California, and its surface waters drain eastward toward Nevada. Arrows indicate annual flows entering and leaving the region for water years 1998, 2000, and 2001.

Chapter 9 North Lahontan Hydrologic Region

Setting

The North Lahontan Hydrologic Region forms part of the western edge of the Great Basin, a large landlocked area that includes most of Nevada and northern Utah. The crest of the Sierra Nevada forms much of the western boundary of this region. All surface water in the region drains eastward toward Nevada. This hydrologic region extends about 270 miles from the Oregon border to the southern boundary of the Walker River drainage in Mono County (Figure 9-1). The region covers 6,122 square miles, about 4 percent of California's total area. The region includes portions of Modoc, Lassen, Sierra, Nevada, Placer, El Dorado, Alpine, Tuolumne, and Mono counties. The northern part of this region is primarily arid high desert with relatively flat valleys at elevations of 4,000 to 5,000 feet, bordered on the west by mountain peaks that reach between 7,000 and 9,000 feet. The central and southern portions of this region are comprised of the eastern slopes of the Sierra Nevada and include the California portion of the Lake Tahoe Basin. The major rivers of the region are the Truckee, Carson and Walker, which carry the mountain snowmelt into Nevada. The mountain crests up to 11,000 feet form the western boundary of the region.

Climate

The region's climate is characterized by dry summers with the exception of occasional scattered thundershowers. Winter precipitation ranges from less than 5 inches in the valleys of Eastern Modoc and Lassen counties to about 30 inches in the Walker Mountains to more than 60 inches in the Sierra Nevada in the upper reaches of the Truckee, Carson and Walker River basins. Most of the winter precipitation is snow, which generally accumulates in mountain areas above 5,000 feet. In the valleys, winter precipitation is a mixture of rain and some snow, which usually melts between storms. Snowpack from the eastern slopes of the Sierra Nevada melts in the late spring and summer to become the primary source of surface water supplies for much of northern Nevada

Population

By 2000, about 99,000 people, a quarter of 1 percent of California's population, lived in the North Lahontan Region. The largest population center is the city of Susanville, the county seat of Lassen County. The cities of Truckee and South Lake Tahoe have large permanent populations, and large transient tourist populations during the summer and winter holidays.

It is estimated that the region's population will grow to 130,800 by 2030. Most of this growth is expected to occur around the existing urban communities of Susanville, Lake Tahoe, Truckee, and the adjacent Martis Valley area. Figure 9-2 provides a graphical depiction of the North Lahontan region's total population from 1960 through 2000, with current projections to 2030.

Land Use

Much of the region is either national forest or lands under the jurisdiction of the Bureau of Land Management. Cattle-ranching is the principal agricultural activity with pasture and alfalfa being the dominant irrigated crops. Commercial crop production is very limited because of the short growing season. Although growing seasons vary considerably each year, the mountain valleys where most crops are grown are usually frost free from late May to mid-September or about 120 days.

Tourism and recreation are the principal economic activities in the Truckee-Tahoe area and the surrounding mountains. On a typical summer day, the number of visitors in the Tahoe basin often exceeds the number of full-time residents. In the Lake Tahoe Basin, urban growth is tightly controlled by the Tahoe Regional Planning Agency, which is responsible for protecting the sensitive environment and water quality of the basin. To the north, the town of Truckee and the adjacent Martis Valley region are experiencing more rapid urban development. For environmental purposes, the principal consumptive use of water is for the State wildlife areas around Honey Lake,

The central and southern portions of the North Lahontan region include the eastern slopes of the Sierra Nevada and the California portion of the Lake Tahoe Basin. (DWR Photo)

which provide important habitat for waterfowl and several threatened or endangered species, including the bald eagle, sand hill crane, bank swallow, and peregrine falcon.

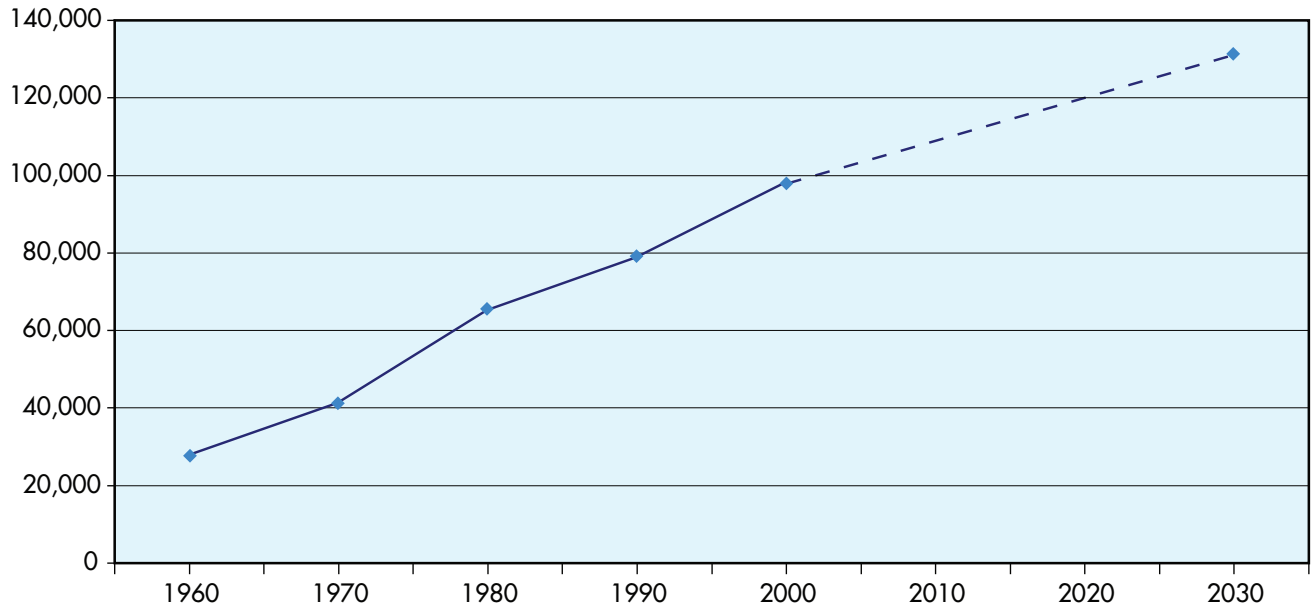
Water Supply and Use

Unimpaired runoff of the streams and rivers averages 1.6 million acre-feet per year, of which only about one-quarter is in the drier northern portion. The largest rivers in the region and their average regulated runoff at the Nevada state line are the Truckee River with 540,000 acre-feet; the Carson River, 335,000 acre-feet; and the Walker River, 300,000 acre-feet. The Susan River is the only major river in the northern half of the region and its annual discharge at Susanville averages 60,000 acre-feet.

The Truckee, Carson, and Walker rivers are governed in large part by existing federal court water rights decrees administered by court-appointed watermasters. The interstate nature of these rivers, combined with the long history of disputes over water rights, has created a complex system of river management criteria. On the Carson River for example, more than 55 years of federal court litigation has been necessary to resolve water rights disputes, resulting in approval of the Alpine Decree, which governs operation of the river today.

Much of the supply from the Truckee, Carson, and Walker rivers has been reserved for use by Nevada interests under various historical water rights settlements, agreements, and SWRCB surface water rights permits. On the California side of these interstate basins, most locally developed water supplies are from groundwater or small surface water diversions, with storage provided by outlet dams constructed on natural lakes. Figure 9-3 provides a graphical presentation of all of the water supply sources that are used to meet the developed water uses in this hydrologic region for 1998, 2000 and 2001. A second chart in this figure summarizes all of the dedicated and developed

Figure 9-2 North Lahontan Hydrologic Region population



Data from California Department of Finance provide decadal population from 1960 to 2000 and population projection for 2030 for the North Lahontan region.

urban, agricultural and environmental water uses within this region for the three years.

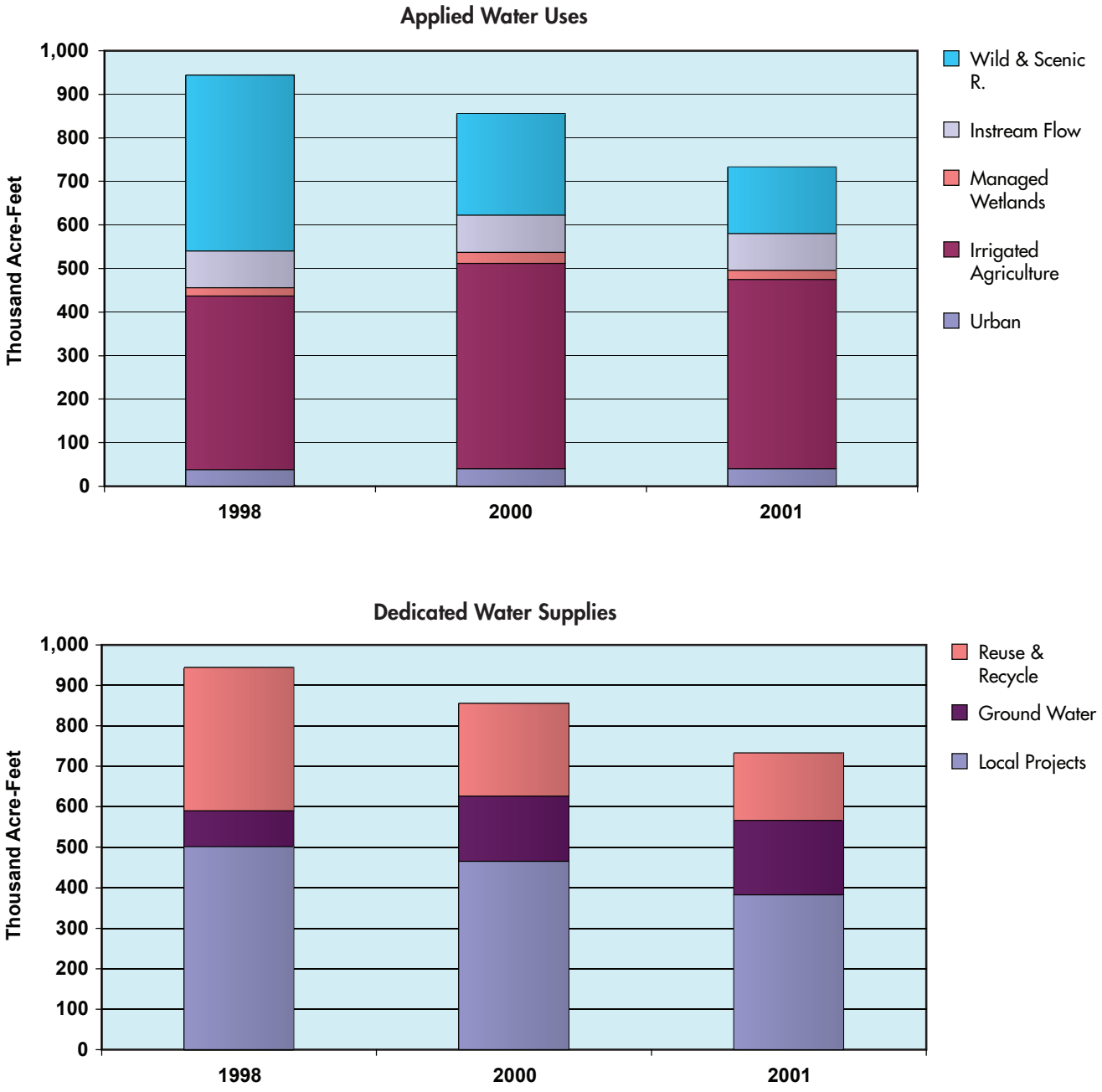
Lake Tahoe is the largest reservoir in the region, with the top 6 feet of storage operated by the U.S. Bureau of Reclamation in conjunction with the federal watermaster to meet downstream water rights in Nevada. Other federal water storage facilities in the Truckee River basin include Stampede Reservoir, Boca Reservoir, and Prosser Creek Reservoir, constructed primarily to provide water supply for urban and agricultural water use in Nevada, downstream flood protection, protection of threatened and endangered species and recreation. Independence and Donner lakes are now operated by Truckee Meadows Water Authority to supply water to the Reno – Sparks region. The U.S. Army Corps of Engineers also completed the Martis Creek Dam in 1971 as additional Truckee River flood protection for the Reno-Sparks area.

Farther south on the Walker River, both Bridgeport Reservoir and Topaz Lake are large reservoirs that capture the spring snowmelt from the Sierra Nevada, and are operated by the Walker River Irrigation District to provide summer irrigation water to Nevada farmers in that watershed.

Most urban water uses in the North Lahontan region are supplied from groundwater wells. There are 24 groundwater basins and two subbasins recognized in the region. Thirteen of these basins are shared with Nevada and one with Oregon. These basins cover about 1,033,240 acres (1,610 square miles) or about 26 percent of the entire region. Information about groundwater storage capacities is available for only six of the 26 basins, and the combined storage for these underground basins is estimated at approximately 24 million acre-feet. Although the groundwater basins were delineated based on mapped alluvial fill, much of the groundwater produced actually comes from underlying fractured rock aquifers. This is particularly true in the volcanic areas of Modoc and Lassen counties where volcanic flows are interstratified with lake sediments and alluvium. Wells constructed in these volcanic formations commonly produce large amounts of groundwater, whereas wells constructed in fine-grained lake deposits produce less. Because the thickness and lateral extent of the fractured hard rocks outside of the defined basin are generally not known, actual groundwater in storage in these areas is also unknown.

About 5,000 acre-feet of reclaimed municipal wastewater are exported out of the Lake Tahoe Basin each year by the South Tahoe Public Utility District for recharge and agri-

Figure 9-3 North Lahontan region water balance for water years 1998, 2000, 2001



Three years show a marked change in the amount and relative proportions of water delivered to North Lahontan region's urban and agricultural sectors and water dedicated to the environment (applied water, top chart), where the water came from, and how much water was reused among sectors (dedicated water supplies, bottom chart).

cultural use in the Carson River watershed. Truckee Tahoe Sanitation Agency also treats wastewater from the north end of the Lake Tahoe Basin and returns about 4,000 acre-feet to the Martis Valley groundwater basin each year. Farther to the north, the Susanville Sanitary District reclaims more than 3,000 acre-feet of wastewater each year for use on nearby irrigated pasturelands.

The principal consumptive uses of water for environmental uses in the region are those of State wildlife areas around Honey Lake. The Honey Lake Wildlife Area in southern Lassen County consists of the 4,271-acre Dakin Unit and the 3,569-acre Fleming Unit. The two units provide important habitat for several threatened or endangered species, including the bald eagle, sand hill crane, bank swallow, and peregrine falcon. This wildlife area has winter-storage rights from the Susan River from November 1 until the last day of February. The HLWA also operates eight wells, each producing between 1,260 and 2,100 gallons per minute. In an average year, the HLWA floods 3,000 acres by March 1 for waterfowl brood habitat.

In 1989, the California Department of Fish and Game purchased the 2,714-acre Willow Creek Wildlife Area in Lassen County to preserve existing wetlands and to increase the potential for waterfowl production and migration habitat. About 2,000 acres are wetlands and riparian habitats. The endangered bald eagle and sand hill crane also inhabit this area. In addition to the Honey Lake and Willow Creek Wildlife Areas, DFG operates the Doyle Wildlife Area, also in the Honey Lake Basin. This wildlife area is protected as dry land winter range for deer and requires less water than the Honey Lake or Willow Creek areas.

River flows that have been designated as wild and scenic constitute a large part of the environmental water use within the North Lahontan region. The east fork of the Carson River and the west fork of the Walker River are listed as State-designated wild and scenic, for the California portions of these two interstate rivers.

State of the Region

Challenges

Much of the northern portion of North Lahontan region is chronically short of water. In the Modoc and Lassen County areas drought is a way of life for agriculture, and seasonal irrigation takes place only as long as water is available. During dry years areas with little or no surface storage may only have irrigation water available for a short period early in the season, resulting in irrigation of limited acreage unless growers are able to supplement their surface water supply by pumping groundwater. However in the Modoc and Lassen County regions groundwater is also limited and some well-pumping capacities are known to diminish very rapidly during the first year of droughts.

While the Truckee River Operating Agreement has the potential to settle 50 years of disputes over Truckee and Carson River waters, the execution and implementation of this agreement will require considerable effort in the coming years. A final environmental impact statement /environmental impact report (EIS/EIR) is being prepared by the U.S. Department of Interior and the California Department of Water Resources to evaluate the potential benefits and impacts of TROA, as well as alternatives to TROA. After the EIS/EIR is completed and certified, TROA will be signed, approved by the courts and implemented. The TROA contains 14 chapters with more than 200 pages of operating criteria and conditions pertaining to water priorities, deliveries and operation of the water facilities in the system.

In the Walker River basin, California and Nevada have been discussing interstate water allocation issues that could potentially affect future uses of the river in both states. The primary issue of concern is the long-term decline in the water level and associated water quality of Walker Lake, which is the river's terminus in central Nevada. The water level at Walker Lake is estimated to have declined by about 140 feet from an historical high elevation of about 4,080 feet in 1882 to 3,941 feet in 2003. Starting in the early 1900s much of the water in the Walker River was developed to provide water to agricultural lands in Nevada. Bridgeport Reservoir and Topaz Lake were built upstream to meet those needs. As the uses increased, the flows to Walker Lake diminished, and the lake has become increasing more saline, such that the lakes historic Lahontan cutthroat trout population is severely threatened. As the lake has declined, the level of salinity as measured by total dissolved solids (TDS) has increased to measured values of 13,000 ppm TDS. Significant increases in the amount of fresh water entering Walker Lake will be needed in order to maintain or restore the fishery, which would likely affect the water uses and supplies of all upstream parties in both states. Other issues that could also affect existing water users in this basin are the potential water rights claims of the Walker River Indian Reservation, which is just upstream of Walker Lake.

Water quality in the North Lahontan region is generally very good, but many communities face specific water quality

problems. These include groundwater contamination from septic tank discharges in urban subdivisions near Susanville and Eagle Lake, and MTBE contamination in South Lake Tahoe. Drinking water quality has also become a greater issue for many surface water systems around Lake Tahoe, forcing many of the smaller private systems to consolidate or change ownership because they are unable to afford the new monitoring and treatment regulatory requirements. South Tahoe Public Utility District, the largest water purveyor in the Tahoe basin, is also experiencing some difficulty in meeting these water quality requirements. The abandoned Leviathan Mine, a Superfund site in the upper reaches of the Carson River watershed, impacts local creeks with acid mine drainage water. The top water quality issues emerging from the Lahontan Regional Water Quality Control Board's (RWQCB's) 2003 Triennial Review included proposals to revise the waste discharge prohibition for piers in Lake Tahoe, and sodium standards for the Carson and Walker Rivers and their tributaries.

Lake Tahoe is the subject of its own chapter in the region's basin plan, and receives many specific and extraordinary water quality protections. The Porter-Cologne Water Quality Control Act bans the discharge of domestic wastewater from California in the Lake Tahoe Basin; the same ban is in effect in Nevada by executive order, resulting in the export of all domestic wastewater from the basin. Discharges of industrial wastewater, wastes from boats and marinas, food wastes, and solid waste are also prohibited in the Tahoe basin. Lake Tahoe's clarity has declined as development has increased around the shoreline, increasing the sediment load and nutrients reaching the lake and its tributaries. In the late 1960s, the clarity of the lake – as measured by the depth to which a Secchi disk (a small white disk of specific size) is visible – was about 100 feet; but in recent years, the average Secchi disk visibility has been closer to 70 feet. Nutrients, such as nitrogen and phosphorous used in landscaping fertilizers, can enter the lake via storm water runoff, promoting growth of algae and thereby reducing clarity. Nitrogen pollution in the basin is primarily due to vehicles, while phosphorous is mostly derived from erosion and dust (phosphate-based detergents are banned).

Roads and road maintenance, including snow removal and de-icing, are the focus of new restrictions that are intended to reduce erosion and other water quality impacts into the streams that enter Lake Tahoe. The traditional use of salt for road de-icing had resulted in adverse impacts to the trees and plants which help prevent erosion and sediment from flowing into the lake. Forest fires, grazing, and logging also present a threat to the lake's water clarity due to related and subsequent erosion into the stream systems. The use of agricultural pesticides in the Lake Tahoe Basin is prohibited, and the Tahoe Regional Planning Agency has more recently banned the use of two-stroke engines in all boats on Lake Tahoe, to prevent contamination from gasoline components such as benzene and MTBE. Other restrictions on land development and soil disturbances are used in the continuing efforts to maintain or improve the lake's water quality, and programs that purchase and preserve sensitive lands are being implemented. Lake Tahoe is now extensively monitored by many federal and State agencies, and researchers such as the University of California, Davis, Tahoe Research Group, and the University of Nevada Desert Research Institute.

Local California interests in the northern part of the Lahontan Region have been apprehensive for several years about plans and proposals from northern Nevada interests in the Reno area that have envisioned the development of additional water supplies from the northeastern California watersheds. In the late 1980s, the Silver State Plan triggered concerns about water exports to Nevada from as far north as Modoc County, more than 150 miles north of Reno. The plan proposed building a pipeline north nearly to the Oregon border to tap groundwater basins, some of which extend across the California-Nevada line. More recently, the proposed Truckee Meadows Project has generated concern about potential depletion of California groundwater supplies in the Honey Lake and Long Valley Creek areas. To date, none of these proposals have been finalized or implemented.

Accomplishments

Years of disputes over the waters of the Truckee and Carson rivers led to the enactment of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Public Law 101-618) in 1990. Provisions of the Settlement Act, including interstate water allocation, will not take effect until several conditions are completed, which include the negotiation and approval of a new Truckee River Operation Agreement (TROA). The act specifies an interstate allocation of the waters between California and Nevada, provides for the settlement of Native American water rights claims at Pyramid Lake, and provides water supplies for specified environmental purposes in Nevada. When it is implemented the act will allocate to California 23,000 acre-feet of surface water annually in the Lake Tahoe Basin, and 32,000 acre-feet of surface water annually in the Truckee River Basin below Lake Tahoe. In the Carson River Basin California will receive water allocations that correspond to existing water uses, and the remainder of the water supplies from both watersheds will be allocated to uses in Nevada.

Negotiation of a proposed Truckee River Operating Agreement began in 1991, involving California and Nevada, the U.S. Department of Interior, the Pyramid Lake Paiute Indian Tribe, Sierra Pacific Power Company, and local water users in both California and Nevada. The language for this 220-page draft operating agreement was finalized in October 2003, and the draft EIR/EIS for implementation of the TROA was released in mid-2004. After the final EIS/EIR is completed and certified, the negotiating parties will sign TROA. When executed, the TROA would establish new daily river operations procedures to meet water rights on the Truckee River and to enhance spawning flows in the lower Truckee River for the threatened fishery species of cui-ui and Lahontan cutthroat trout. TROA would provide for management of water in the Truckee basin in California, including instream flow requirements and reservoir storage for fishery and recreation uses, and would include procedures for coordinating releases and exchanges of water among the watershed's reservoirs. TROA would become the exclusive federal regulations governing water stored in Lake Tahoe, Martis Creek, Prosser Creek, Stampede, and Boca reservoirs. The agreement would also provide an accounting procedure for surface and groundwater diversions in California's part of the Truckee Basin and would enhance streamflows for recreational purposes.

Programs to manage and restore the water quality and clarity of Lake Tahoe are making progress by regulating development within the basin and by working to reduce surface water pollutants from entering the lake. The Tahoe Regional Planning Agency is a bistate agency created by Congress with authority to set regional environmental standards, issue land use permits, including conditions to protect water quality, and take enforcement actions throughout the basin. TRPA's regional plan includes specific goals and timetables for accomplishing environmental objectives, and this bi-state agency also implements capital improvement programs to repair environmental damage and restore water quality. TRPA has identified nearly $500 million in capital improvements that are needed to achieve the regional plan's environmental targets. Federal, state, and local governments have invested nearly $90 million in erosion control, storm water drainage, stream zone restoration, public transit, and other capital projects. The USFS's Lake Tahoe Basin Management Unit controls more than 70 percent of the land in the Lake Tahoe Basin. The LTBMU has begun a watershed restoration program and a land acquisition program to prevent development of sensitive private lands. Within the California side of this basin, the Lahontan Regional Water Quality Control Board has a major role in protecting Lake Tahoe, by actively monitoring and enforcing surface water quality for all uses and discharges. In recent years, federal and state agencies have increased funding to protect the environment of Lake Tahoe. Nevada approved a $20 million bond measure to perform erosion control and other measures on the east side of the lake. In California, Proposition 204 recently provided $10 million in bond funds for land acquisition and programs to control soil erosion, restore watersheds, and preserve environmentally sensitive lands.

On the Carson and Walker rivers, the California Department of Fish and Game is also concerned about maintaining instream flows and reservoir pools to restore and preserve the fishery. In conjunction with American Land Conservancy, a private land trust organization, DFG has been acquiring lands and water rights at Heenan Lake in the upper watershed of the East Fork of the Carson River. This small reservoir was originally built to supply irrigation water for Nevada, but it is now being used by DFG to raise Lahontan cutthroat trout to stock in other locations throughout the Sierra Nevada. Selected sections of the upper Carson River tributaries are managed by DFG as wild trout waters, where stocking of hatchery fish is not allowed. The goal of these efforts is to maintain and preserve the trout fishery in both the upper Carson and Walker rivers, which are recognized as some of the best trout fishing in the state.

Relationship with Other Regions

Because the river channels of the Truckee, Carson and Walker rivers' naturally flow into Nevada, a large amount of the surface water from these watersheds has historically been reserved for use by Nevada interests under various interstate water rights settlements and agreements. Most of the surplus flows from these three rivers also flow into Nevada, where it is used for a variety of purposes. There are two small historic exports of surface water out of the North Lahontan hydrologic region to the Sacramento River region. At Echo Lakes in the upper Lake Tahoe Basin, an average of about 2,000 acre-feet per year is exported through a tunnel into the south fork of the American River in conjunction with a hydroelectric power development that began in 1876. Another water export of about 6,000 acre-feet per year is taken from the upper reaches of the Little Truckee River for irrigation use in Sierra Valley (a part of the Feather River Basin within the Sacramento River region). Near the southern end of the North Lahontan region another small water diversion exists, providing surface water from the upper tributaries of the Walker River to the Mono Lake Basin for summer irrigation purposes.

The only water import into the North Lahontan region occurs in northern Lassen County, where an average of about 3,000 acre-feet is imported from a tributary of the South Fork Pit River (Sacramento River Region) for irrigation in the Madeline Plains area.

Looking to the Future

The northern part of this hydrologic region contains portions of Modoc, Lassen and Sierra counties, in which no major changes in water use are anticipated in the near future. A small amount of agricultural expansion may be possible in areas that can support additional groundwater development. Likewise, the modest need for additional municipal and irrigation supplies can be met by some expansion of present surface systems or by increased use of groundwater.

Concern for protecting the limited groundwater resources of the region has led to establishment of formal groundwater management programs in the Honey Lake and Long Valley basins. In Modoc County, similar groundwater proposals are being considered for the Surprise Valley region. At present, neither the Honey Lake nor Long Valley groundwater management districts are active, but can be activated when needed. In the Lake Tahoe and Truckee River basins, the proposed Truckee River Operating Agreement (TROA) interstate allocation would also establish limits on groundwater procedures and withdrawal limits from these areas.

The interstate surface waters of the Truckee, Carson and Walker rivers are controlled by federal watermasters according to existing federal court decrees. Each of these legal decrees may be revised to some degree within the next decade, as a result of TROA implementation on the Truckee River and through mediation regarding the Walker River water uses. Since further water development in these basins may be limited, especially in Nevada, water transfers are expected to play an increasing role to meet changing and higher-priority needs. In Nevada, such water transfers have already occurred through the acquisition of agricultural lands and water rights which are then transferred to meet municipal needs in Reno/Sparks region.

Within the Placer and Nevada county portions of the North Lahontan region, several large residential and commercial developments are being proposed for the Truckee and Martis Valley regions. If these developments are completed, it is likely that significant new demands will be placed on the groundwater supplies and sewage disposal capabilities of this region.

Water Portfolios for Water Years 1998, 2000, and 2001

Water year 1998 was a wet year for this region, with annual precipitation at 142 percent of normal, while the statewide annual precipitation was 171 percent of average. Year 2000 represents approximately normal hydrologic conditions with annual precipitation at 89 percent of average for the North Lahontan region. 2001 reflected dry-water-year conditions with annual precipitation at 49 percent of average. For comparison, statewide average precipitation in year 2001 was 72 percent of normal. Table 9-1 provides more detailed information about the total water supplies available to this region for these three specific years from precipitation, imports and groundwater, and also summarizes the uses of all of the water supplies. The data in Table 9-1 shows that more water from these three interstate rivers flows into Nevada than is consumptively used in the North Lahontan region.

A more detailed tabulation of the dedicated portion of the total available water used for urban, agricultural and environmental purposes is presented in Table 9-2. Because most of the North Lahontan region is largely undeveloped, dedicated environmental water uses are a larger component of the total developed water uses in this region. Table 9-2 also provides detailed information about the sources of the developed water supplies, which are obtained from a mix of both surface water and groundwater supplies. The water portfolio tables at the end of this chapter summarize the detailed regional water accounting for all agricultural, urban and dedicated environmental water uses of the region. Graphical representations of the regions water supplies and uses are also presented in the water portfolio diagrams in Figures 9-4 and 9-5.

Selected References

2002 California 305(b) Report on Water Quality, State Water Resources Control Board

California's Groundwater Bulletin 118-03, Update 2003, California Department of Water Resources

Nonpoint Source Program Strategy and Implementation Plan, 1998-2013, State Water Resources Control Board, California Coastal Commission, January 2000

Strategic Plan, State Water Resources Control Board, Regional Water Quality Control Boards, November 15, 2001

Truckee River Operation Agreement, Draft October 2003

Water Quality Control Plan, Regional Water Quality Control Board

Watershed Management Initiative Chapter, Regional Water Quality Control Board

Table 9-1 North Lahontan Hydrologic Region Water Balance Summary - TAF

Water Entering the Region – Water Leaving the Region = Storage Changes in Region

	Water Year (Percent of Normal Precipitation)		
	1998 (142%)	2000 (89%)	2001 (49%)
Water Entering the Region			
Precipitation	10,655	6,708	3,756
Inflow from Oregon/Mexico	0	0	0
Inflow from Colorado River	0	0	0
Imports from Other Regions	3	3	3
Total	**10,658**	**6,711**	**3,759**
Water Leaving the Region			
Consumptive Use of Applied Water * (Ag, M&I, Wetlands)	263	327	307
Outflow to Nevada	1,391	754	552
Exports to Other Regions	12	12	9
Statutory Required Outflow to Salt Sink	180	141	113
Additional Outflow to Salt Sink	83	92	92
Evaporation, Evapotranspiration of Native Vegetation, Groundwater Subsurface Outflows, Natural and Incidental Runoff, Ag Effective Precipitation & Other Outflows	8,572	5,493	3,223
Total	**10,501**	**6,819**	**4,296**
Storage Changes in the Region			
[+] Water added to storage			
[-] Water removed from storage			
Change in Surface Reservoir Storage	147	-66	-430
Change in Groundwater Storage **	10	-42	-107
Total	**157**	**-108**	**-537**
Applied Water * (compare with Consumptive Use)	432	524	490

***Footnote for applied water**

Consumptive use is the amount of applied water used and no longer available as a source of supply. Applied water is greater than consumptive use because it includes consumptive use, reuse, and outflows.

****Footnote for change in Groundwater Storage**

Change in Groundwater Storage is based upon best available information. Basins in the north part of the state (North Coast, San Francisco, Sacramento River and North Lahontan regions and parts of Central Coast and San Joaquin River regions) have been modeled – spring 1997 to spring 1998 for the 1998 water year and spring 1999 to spring 2000 for the 2000 water year. All other regions and year 2001 were calculated using the following equation:

GW change in storage =
intentional recharge + deep percolation of applied water + conveyance deep percolation - withdrawals

This equation does not include the unknown factors such as natural recharge and subsurface inflow and outflow.

Table 9-2 North Lahontan Hydrologic Region Water Use and Distribution of Dedicated Supplies (TAF)

	1998			2000			2001		
	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion	Applied Water Use	Net Water Use	Depletion
WATER USE									
Urban									
Large Landscape	2.3			2.6			2.6		
Commercial	9.0			9.7			9.3		
Industrial	12.5			12.5			12.5		
Energy Production	0.0			0.0			0.0		
Residential - Interior	7.9			9.0			8.7		
Residential - Exterior	6.2			6.3			7.2		
Evapotranspiration of Applied Water		8.8	8.8		8.7	8.7		9.4	9.4
Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Outflow		14.9	14.9		16.1	16.1		16.5	16.5
Conveyance Losses - Applied Water	0.0			0.0			0.0		
Conveyance Losses - Evaporation		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Urban Use	**37.9**	**23.7**	**23.7**	**40.1**	**24.8**	**24.8**	**40.3**	**25.9**	**25.9**
Agriculture									
On-Farm Applied Water	375.1			462.4			428.4		
Evapotranspiration of Applied Water		241.1	241.1		301.3	301.3		281.1	281.1
Irrecoverable Losses		19.5	19.5		20.2	20.2		12.5	12.5
Outflow		66.8	66.8		75.8	75.8		74.7	74.7
Conveyance Losses - Applied Water	23.5			13.4			6.2		
Conveyance Losses - Evaporation		2.3	2.3		1.7	1.7		1.0	1.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		1.5	1.5		1.1	1.1		0.0	0.0
GW Recharge Applied Water	0.0			0.0			0.0		
GW Recharge Evap + Evapotranspiration		0.0	0.0		0.0	0.0		0.0	0.0
Total Agricultural Use	**398.6**	**331.2**	**331.2**	**475.8**	**400.1**	**400.1**	**434.6**	**369.3**	**369.3**
Environmental									
Instream									
Applied Water	84.6			85.0			84.5		
Outflow		84.6	84.6		85.0	85.0		84.5	84.5
Wild & Scenic									
Applied Water	404.1			233.3			152.5		
Outflow		95.6	95.6		56.2	56.2		28.7	28.7
Required Delta Outflow									
Applied Water	0.0			0.0			0.0		
Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Managed Wetlands									
Habitat Applied Water	18.7			25.9			20.5		
Evapotranspiration of Applied Water		13.2	13.2		19.8	19.8		16.9	16.9
Irrecoverable Losses		0.2	0.2		0.3	0.3		0.2	0.2
Outflow		0.0	0.0		0.6	0.6		0.0	0.0
Conveyance Losses - Applied Water	0.0			0.0			0.0		
Conveyance Losses - Evaporation		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Irrecoverable Losses		0.0	0.0		0.0	0.0		0.0	0.0
Conveyance Losses - Outflow		0.0	0.0		0.0	0.0		0.0	0.0
Total Managed Wetlands Use	18.7	13.4	13.4	25.9	20.7	20.7	20.5	17.1	17.1
Total Environmental Use	**507.4**	**193.6**	**193.6**	**344.2**	**161.9**	**161.9**	**257.5**	**130.3**	**130.3**
TOTAL USE AND LOSSES	**943.9**	**548.5**	**548.5**	**860.1**	**586.8**	**586.8**	**732.4**	**525.5**	**525.5**
DEDICATED WATER SUPPLIES									
Surface Water									
Local Deliveries	501.4	501.4	501.4	469.5	469.5	469.5	311.8	311.8	311.8
Local Imported Deliveries	0.3	0.3	0.3	0.3	0.3	0.3	3.3	3.3	3.3
Colorado River Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CVP Base and Project Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Federal Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Environmental Instream Flow	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groundwater									
Net Withdrawal	41.8	41.8	41.8	112.0	112.0	112.0	189.6	189.6	189.6
Artificial Recharge	0.0			0.0			0.0		
Deep Percolation	46.7			49.6			45.3		
Reuse/Recycle									
Reuse Surface Water	348.7			223.7			161.6		
Recycled Water	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL SUPPLIES	**943.9**	**548.5**	**548.5**	**860.1**	**586.8**	**586.8**	**716.6**	**509.7**	**509.7**
Balance = Use - Supplies	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***-15.8***	***-15.8***	***-15.8***